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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/537,509	11/30/2005	Fumitsugu Fukuyo	46884-5388 (211285)	4531

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EXAMINER	
ULLAH, ELIAS	
ART UNIT	**PAPER NUMBER**
2892	

MAIL DATE	DELIVERY MODE
05/12/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/537,509	FUKUYO ET AL.	
	Examiner	Art Unit	
	ELIAS ULLAH	2892	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 February 2009*.

2a)☒ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-45* is/are pending in the application.

4a) Of the above claim(s) *23-32,40 and 41* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-22,33-39 and 42-45* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *03 June 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *9/2/2008, 9/18/2008, 10/10/2008, 11/10/2008, 12/2/2008, 1/28/2009, 4/13/2009.*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

This office action is in response to an amendment filed on 2/19/2009.

Claim Rejections - 35 USC § 112

1. Claims 4, 6, 10, 14 and 18 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In base claim 4, among other things applicant claimed “irradiation of the laser light on a laser incident surface of the semiconductor substrate and no molten region is formed on the laser incident surface”. However, applicants failed to point out how no molten process region is formed. For purpose of examination, Examiner assumes the only molten process region is formed by laser irradiation.

2. Claims 4, 6, 10, 14, 18, 19-22, 36-39, 43 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 19-22, 36-39, 43, among other things applicant claimed “the semiconductor is completely divided without forming any gap". However applicants failed to particularly point out how semiconductor is “completely divided without forming any gap”. For purpose of examination, Examiner assumes the generating stress by laser in the semiconductor substrate along the part which is intended to be cut.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

1. Claims 1-22, 33-39, 42-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Umehara et al. (Umehara, US 5,882,956) in view of Sawada (US 6,770,544) of record.

With regard to claims 1, 3 and 42, Umehara teaches a method of cutting a semiconductor substrate (Fig. 4), the method comprising the steps of: irradiating a semiconductor substrate (Fig. 6, 6) having a sheet bonded (Fig. 1, 10) hereto by way of a die- bonding resin layer 4 and expanding the sheet 10 (col. 7, lines 6+) after the step of forming the part (Fig. 3) which is intended to be cut to divided the die bonding resin layer 4 (Fig. 4) together with the semiconductor substrate 6 to separate the

semiconductor substrate 6 with the die bonding resin layer 4 attached to the semiconductor substrate 6 to from a gap (Fig. 5, spacing between layer 3) with a predetermined with between adjacent divided parts of the semiconductor substrate 6 (Fig. 5) with the die boding resin layer 4 attached to the divided parts (Fig. 5) of the semiconductor substrate 6 so as to cut the semiconductor substrate 6 and die bonding resin layer 4 along the part which is intended to be cut (Fig. 5).

Umehara teaches cutting is done be dicing (col. 7, lines 1+), but fails to teach a laser light having a wavelength that enables the laser light to transmit through the semiconductor substrate while locating a light converging point within the semiconductor substrate, so as to from a modified region caused by photon absorption within the semiconductor substrate without forming any gap in a line along which the semiconductor substrate is intended to be divided and causing the modified region to form a part which is intended to be cut.

However Sawada teaches a laser light (Fig. 14(A), L), having a wavelength (col.8, lines 22+) that enables the laser light to transmit (the laser teaches by Sawada in col. 3, lines 56+ is substantially identical as applicants disclosed in [0065] i.e. YAG laser) through the semiconductor substrate (W) while locating a light-converging point within the semiconductor substrate (W) and without forming any gaps (Fig. 14(A) wherein initial laser irradiation is done along the scribeline, furthermore applicant did not claimed type of laser been used so Examine assumed YAG laser irradiation disclosed by applicants will not create any gaps on the substrate and the laser teaches by Sawada in col. 3. lines 56+ is substantially identical and capable to similar function) in

line along which the substrate W is intended to be divided (Fig. 14 (A)). At the time the invention was made, it would have been obvious to a person having ordinary skill in the art to use a laser light to irradiate a semiconductor substrate to cerate a molten process region teaching of Sawada in the method of cutting semiconductor substrate of Umehara, because laser irradiation scribed line width can be designed to be narrow thus increasing the number of element s per substrate compare to dicing the substrate as taught by Sawada in (col. 3, lines 60+).

Furthermore, the recitation of "so as to form a modified region caused by photon absorption within the semiconductor substrate without forming any gap in a line along which the semiconductor substrate is intended to be divided, and causing the modified region to form a part which is intended to be cut" is substantially identical to the irradiating laser recited in Sawada in (col. 2, lines 60-67) is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent. Or where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a *prima facie* case of either anticipation or obviousness has been established. *In re Best*, 195 USPQ 430, 433 (CCPA 1977) and MPEP 2112.02.

With regard to claims 2 and 4, Umehara teaches a method of cutting a semiconductor substrate (Fig. 4), the method comprising the steps of: irradiating a semiconductor substrate (Fig. 6, 6) having a sheet bonded (Fig. 1, 10) hereto by way of a die- bonding resin layer 4 and expanding the sheet 10 (col. 7, lines 6+) after the step of forming the part (Fig. 3) which is intended to be cut to divided the die bonding resin

layer 4 (Fig. 4) together with the semiconductor substrate 6 to separate the semiconductor substrate 6 with the die bonding resin layer 4 attached to the semiconductor substrate 6 to from a gap (Fig. 5, spacing between layer 3) with a predetermined with between adjacent divided parts of the semiconductor substrate 6 (Fig. 5) with the die boding resin layer 4 attached to the divided parts (Fig. 5) of the semiconductor substrate 6 so as to cut the semiconductor substrate 6 and die bonding resin layer 4 along the part which is intended to be cut (Fig. 5).

Umehara teaches cutting is done be dicing (col. 7, lines 1+), but fails to teach a laser light having a wavelength that enables the laser light to transmit through the semiconductor substrate while locating a light converging point within the semiconductor substrate under a condition with a pack power density of at least 1×10^8 ($W/cm^{2)}$ at the light-converging point with pulse width of 1μs or less , so as to from a modified region including a molten processed region within the semiconductor substrate is intended to be divided and causing the modified region including the molten processed region to form a part which is intended to be cut.

However Sawada teaches a laser light (Fig. 14(A), L), having a wavelength (col.8, lines 22+) that enables the laser light to transmit (the laser teaches by Sawada in col. 3, lines 56+ is substantially identical as applicants disclosed in [0065] i.e. YAG laser) through the semiconductor substrate (W) while locating a light-converging point within the semiconductor substrate (W) and without forming any gaps (Fig. 14(A) wherein initial laser irradiation is done along the scribeline, furthermore applicant did not claimed type of laser been used so Examine assumed YAG laser irradiation disclosed

by applicants will not create any gaps on the substrate and the laser teaches by Sawada in col. 3. lines 56+ is substantially identical and capable to similar function) in line along which the substrate W is intended to be divided (Fig. 14 (A)) an and a pulse width of 1 μs or less (Col. 4, lines 51-53). At the time the invention was made, it would have been obvious to a person having ordinary skill in the art to use a laser light to irradiate a semiconductor substrate to cerate a molten process region teaching of Sawada in the method of cutting semiconductor substrate of Umehara, because laser irradiation scribed line width can be designed to be narrow thus increasing the number of elements per substrate compare to dicing the substrate as taught by Sawada in (col. 3, lines 60+).

Furthermore, the recitation of "so as to form a modified region including a molten caused by photon absorption within the semiconductor substrate without forming any gap in a line along which the semiconductor substrate is intended to be divided, and causing the modified region to form a part which is intended to be cut" is substantially identical to the irradiating laser recited in Sawada in (col. 2, lines 60-67 and col. 8, lines 20+) is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent. Or where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a *prima facie* case of either anticipation or obviousness has been established. *In re Best*, 195 USPQ 430, 433 (CCPA 1977) and MPEP 2112.02.

Umehara and Sawada fail to disclose specific laser light to from a modified region under a condition with a peak power density of at least 1 x 108 (W/cm2) at the ight-converging point.

Sawada discloses a general laser light to from a modified region under a condition with a peak power density of at least 1 x 108 (W/cm2) at the light-converging point and pulse width (col. 3, lines 35-50 see also US Ref. US 6,376,797 in col. 3, lines 25-50 for mere facts). Accordingly, it would have been obvious to one of ordinary skill in art to use teaching Sawada in the range as claimed, because it has been held that where the general conditions of the claims are discloses in the prior art, it is not inventive to discover the optimum or workable range by routine experimentation. MPEP 2144.05.

With regard to claims 5-6, fail to teach the modified region is a molten processed region.

However, Sawada teaches modified region (G in Fig. 14(B)) is a molten processed region (Col. 2, lines 64-65) see also above claim 1 discussion for combination of Sawada's teaching.

With regard to claims 7, and 9-10 Umehara fails to teach a fracture is caused to reach a front face of the semiconductor substrate on the laser light entrance side from the part which is intended to be cut acting as a start point.

However, Sawada teaches a fracture is caused to reach a front face (Col. 2, lines 1-3 and col. 3, lines 4-6) of the semiconductor substrate (W) on the laser light

entrance side from the part which is intended to be cut acting as a start point (G). See above claim 1 discussion for combination of Sawada's teaching.

With regard to claim 8, Umehara fails a fracture is caused to reach a front face of the semiconductor substrate on the laser light entrance side from the part which is intended to be cut acting as a start point.

However, Sawada teaches a fracture is caused to reach a front face (Col. 2, lines 1-3 and col. 3, lines 4-6) of the semiconductor substrate (W) on the laser light entrance side from the part which is intended to be cut acting as a start point (G). See above claim 1 discussion for combination of Sawada's teaching.

With regard to claims12 and 16, Umehara fails to teach a fracture is caused to react a front face of the semiconductor substrate on the laser light entrance side and a rear face on the side opposite therefrom from the part which is intended to be cut acting as a start point.

However, Sawada teaches a fracture is caused to react a front face of the semiconductor substrate on the laser light entrance side (Col. 2, lines 1-3 and col. 3, lines 4-6) and a rear face on the side opposite therefrom from the part which is intended to be cut acting as a start point (Fig. 14(C)). See above claim 1 discussion for combination of Sawada's teaching.

With regard to claims 11, 13-15 and 17-18, Umehara fails to teach a fracture is caused to react a front face of the semiconductor substrate on the laser light entrance side and a rear face on the side opposite therefrom from the part which is intended to be cut acting as a start point .

However, Sawada teaches to teach a fracture is caused to react a front face of the semiconductor substrate on the laser light entrance side (Col. 2, lines 1-3 and col. 3, lines 4-6) and a rear face on the side opposite therefrom from the part which is intended to be cut acting as a start point (Fig. 14(C)). See above claim 1 discussion for combination of Sawada's teaching.

With regard to claims 19, 21,33, 35-37, 39 and 43-45, Umehara teaches a method of cutting a semiconductor substrate (Fig. 4), the method comprising the steps of: irradiating a semiconductor substrate (Fig. 6, 6) having a sheet bonded (Fig. 1, 10) hereto by way of a die- bonding resin layer 4 and expanding the sheet 10 (col. 7, lines 6+) after the step of forming the part (Fig. 3) which is intended to be cut to divided the die bonding resin layer 4 (Fig. 4) together with the semiconductor substrate 6 to separate the semiconductor substrate 6 with the die bonding resin layer 4 attached to the semiconductor substrate 6 to from a gap (Fig. 5, spacing between layer 3) with a predetermined with between adjacent divided parts of the semiconductor substrate 6 (Fig. 5) with the die boding resin layer 4 attached to the divided parts (Fig. 5) of the semiconductor substrate 6 so as to cut the semiconductor substrate 6 and die bonding resin layer 4 along the part which is intended to be cut (Fig. 5).

Umehara teaches cutting is done be dicing (col. 7, lines 1+), but fails to teach a laser light having a wavelength that enables the laser light to transmit through the semiconductor substrate while locating a light converging point within the semiconductor substrate, so as to from a modified region caused by photon absorption within the semiconductor substrate without forming any gap in a line along which the

semiconductor substrate is intended to be divided and causing the modified region to form a part which is intended to be cut and the modified regions a molten processed region.

However Sawada teaches a laser light (Fig. 14(A), L), having a wavelength (col.8, lines 22+) that enables the laser light to transmit (the laser teaches by Sawada in col. 3, lines 56+ is substantially identical as applicants disclosed in [0065] i.e. YAG laser) through the semiconductor substrate (W) while locating a light-converging point within the semiconductor substrate (W) and without forming any gaps (Fig. 14(A) wherein initial laser irradiation is done along the scribeline, furthermore applicant did not claimed type of laser been used so Examine assumed YAG laser irradiation disclosed by applicants will not create any gaps on the substrate and the laser teaches by Sawada in col. 3. lines 56+ is substantially identical and capable to similar function) in line along which the substrate W is intended to be divided (Fig. 14 (A)) and modified region (G in Fig. 14(B)) is a molten processed region (Col. 2, lines 64-65). At the time the invention was made, it would have been obvious to a person having ordinary skill in the art to use a laser light to irradiate a semiconductor substrate to cerate a molten process region teaching of Sawada in the method of cutting semiconductor substrate of Umehara, because laser irradiation scribed line width can be designed to be narrow thus increasing the number of element s per substrate compare to dicing the substrate as taught by Sawada in (col. 3, lines 60+).

Furthermore, the recitation of “so as to form a modified region caused by photon absorption within the semiconductor substrate without forming any gap in a line along

which the semiconductor substrate is intended to be divided, and causing the modified region to form a part which is intended to be cut" is substantially identical to the irradiating laser recited in Sawada in (col. 2, lines 60-67) is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent. Or where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a *prima facie* case of either anticipation or obviousness has been established. *In re Best*, 195 USPQ 430, 433 (CCPA 1977) and MPEP 2112.02.

With regard to claims 20, 34, 38, Umehara teaches a method of cutting a semiconductor substrate (Fig. 4), the method comprising the steps of: irradiating a semiconductor substrate (Fig. 6, 6) having a sheet bonded (Fig. 1, 10) hereto by way of a die- bonding resin layer 4 and expanding the sheet 10 (col. 7, lines 6+) after the step of forming the part (Fig. 3) which is intended to be cut to divided the die bonding resin layer 4 (Fig. 4) together with the semiconductor substrate 6 to separate the semiconductor substrate 6 with the die bonding resin layer 4 attached to the semiconductor substrate 6 to from a gap (Fig. 5, spacing between layer 3) with a predetermined with between adjacent divided parts of the semiconductor substrate 6 (Fig. 5) with the die boding resin layer 4 attached to the divided parts (Fig. 5) of the semiconductor substrate 6 so as to cut the semiconductor substrate 6 and die bonding resin layer 4 along the part which is intended to be cut (Fig. 5).

Umehara teaches cutting is done be dicing (col. 7, lines 1+), but fails to teach a laser light having a wavelength that enables the laser light to transmit through the

semiconductor substrate while locating a light converging point within the semiconductor substrate under a condition with a pack power density of at least 1 x 10^8 ($W/cm^{2)}$ at the light-converging point with pulse width of 1μs or less , so as to from a modified region including a molten processed region within the semiconductor substrate is intended to be divided and causing the modified region including the molten processed region to form a part which is intended to be cut.

However Sawada teaches a laser light (Fig. 14(A), L), having a wavelength (col.8, lines 22+) that enables the laser light to transmit (the laser teaches by Sawada in col. 3, lines 56+ is substantially identical as applicants disclosed in [0065] i.e. YAG laser) through the semiconductor substrate (W) while locating a light-converging point within the semiconductor substrate (W) and without forming any gaps (Fig. 14(A) wherein initial laser irradiation is done along the scribeline, furthermore applicant did not claimed type of laser been used so Examine assumed YAG laser irradiation disclosed by applicants will not create any gaps on the substrate and the laser teaches by Sawada in col. 3. lines 56+ is substantially identical and capable to similar function) in line along which the substrate W is intended to be divided (Fig. 14 (A)) an and a pulse width of 1 μs or less (Col. 4, lines 51-53). At the time the invention was made, it would have been obvious to a person having ordinary skill in the art to use a laser light to irradiate a semiconductor substrate to cerate a molten process region teaching of Sawada in the method of cutting semiconductor substrate of Umehara, because laser irradiation scribed line width can be designed to be narrow thus increasing the number

of elements per substrate compare to dicing the substrate as taught by Sawada in (col. 3, lines 60+).

Furthermore, the recitation of "so as to form a modified region including a molten caused by photon absorption within the semiconductor substrate without forming any gap in a line along which the semiconductor substrate is intended to be divided, and causing the modified region to form a part which is intended to be cut" is substantially identical to the irradiating laser recited in Sawada in (col. 2, lines 60-67 and col. 8, lines 20+) is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent. Or where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a *prima facie* case of either anticipation or obviousness has been established. *In re Best*, 195 USPQ 430, 433 (CCPA 1977) and MPEP 2112.02.

Umehara and Sawada fail to disclose specific laser light to from a modified region under a condition with a peak power density of at least 1 x 108 (W/cm2) at the ight-converging point.

Sawada discloses a general laser light to from a modified region under a condition with a peak power density of at least 1 x 108 (W/cm2) at the light-converging point and pulse width (col. 3, lines 35-50 see also US Ref. US 6,376,797 in col. 3, lines 25-50 for mere facts). Accordingly, it would have been obvious to one of ordinary skill in art to use teaching Sawada in the range as claimed, because it has been held that where the general conditions of the claims are discloses in the prior art, it is not

inventive to discover the optimum or workable range by routine experimentation. MPEP 2144.05.

Response to Arguments

2. Applicant's arguments with respect to claim 1-22, 33-39, 42-45 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

3. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ELIAS ULLAH whose telephone number is (571)272-1415. The examiner can normally be reached on weekdays, between 8AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thao Le can be reached on (571) 272-1708. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Elias Ullah/
Examiner, Art Unit 2892

/Thao X Le/
Supervisory Patent Examiner, Art Unit 2892